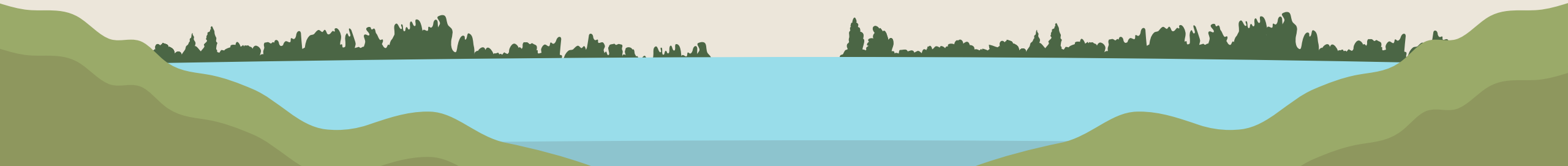
Data-Science for Grain Marketing Decision Making: Planting Progress and Crop Condition Interactive Dashboard

By Maryam Rehmatulla and Shlok Kulkarni

Introduction

Our Project is to develop an interactive dashboard to support Virginia corn producers in making informed grain marketing decisions using real-time USDA NASS data. The tool is designed to visualize county-level crop conditions and planting progress, with historical comparisons and simple forecasting. Currently, we're exploring crop conditions, planting progress, areas planted, and yield.



Crop Conditions

- Downloaded USDA NASS weekly corn crop condition data for 2021–2024
- Worked with multiple datasets representing quality levels:
  - Excellent, Good, Fair, Poor, and Very Poor
- Built overlaying line plots to visualize trends and patterns across condition categories
- Began integrating the project into an R Shiny interactive dashboard
- Added toggle and select features to allow users to compare crop condition categories dynamically

Planting Progress and Crop Condition Interactive Dashboard

About This Data

This section presents weekly crop condition data for corn in Virginia from 2021 to 2024, sourced from the USDA National Agricultural Statistics Service (NASS). The data is based on survey responses evaluating crop health, categorized into five condition levels: Excellent, Good, Fair, Poor, and Very Poor.

Weekly observations span Week 19 to Week 38, which approximately correspond to the months of mid-May through mid-September. These ratings offer insight into how Virginia's corn crops performed throughout the growing season each year.

Select Year(s):

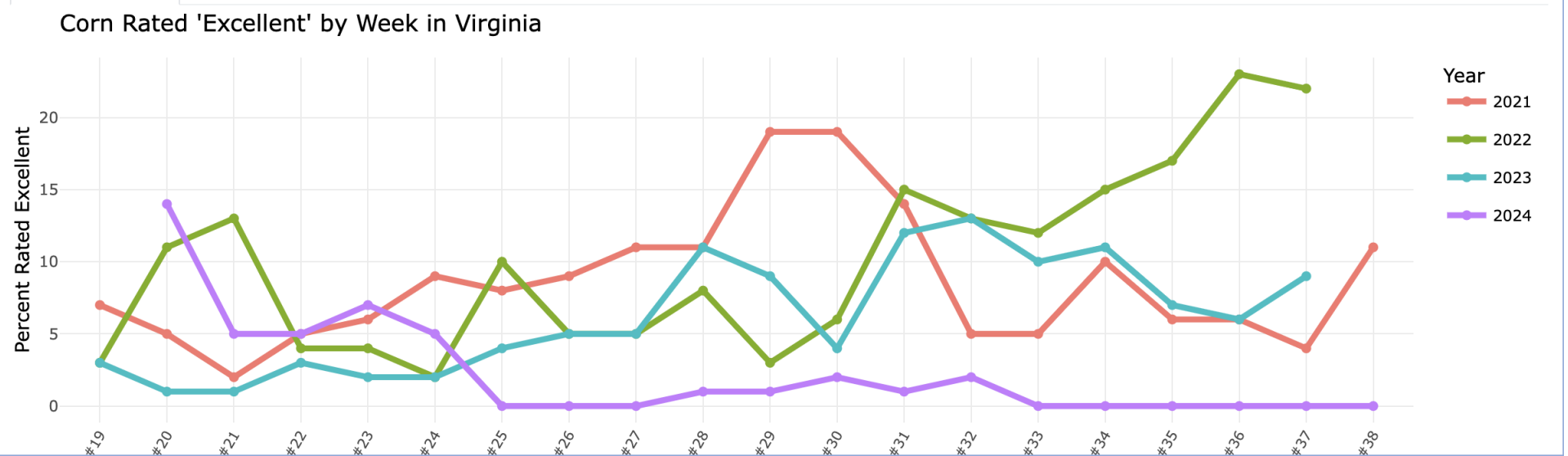
2021, 2022, 2023, 2024

Select Week Range:

19 38

19 21 23 25 27 29 31 33 35 37 38

Excellent | Fair | Good | Poor | Very Poor



Acres Planted

- Built an interactive map that shows how many acres of corn were planted in each Virginia county from 2021 to 2024, using data from USDA/NASS.
- Cleaned up the county names to match the map boundaries so everything lines up correctly.
- Made it easy to switch between years and see exact acres planted when you hover over a county.
- Right now, the focus is just on total acres planted. Next week, I plan to add more data like biotech planted areas, herbicide resistance, grain production, and irrigation info to make the dashboard even more detailed.

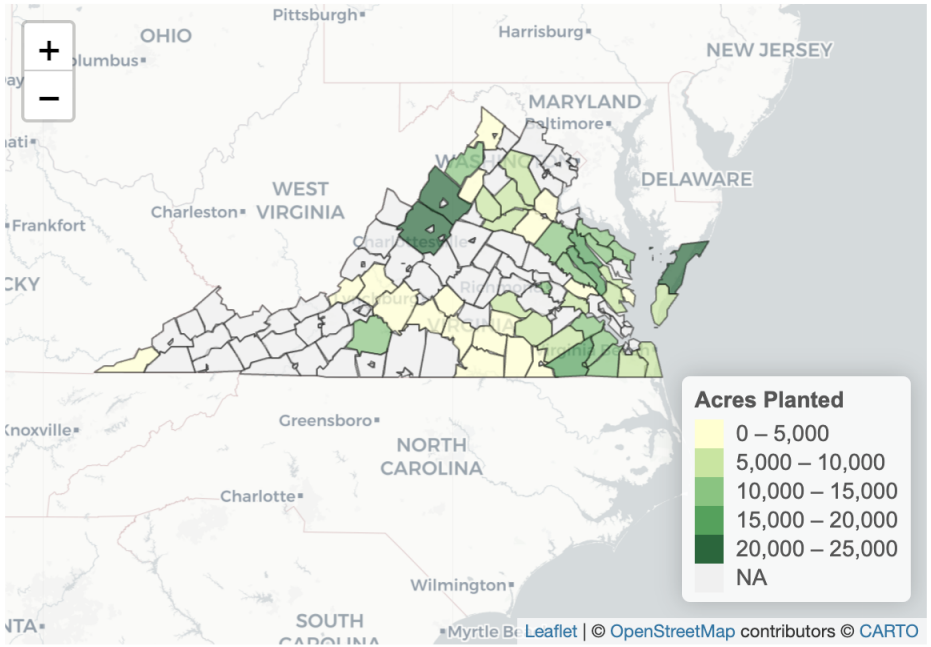
Planting Progress and Crop Condition Interactive Dashboard

About This Data

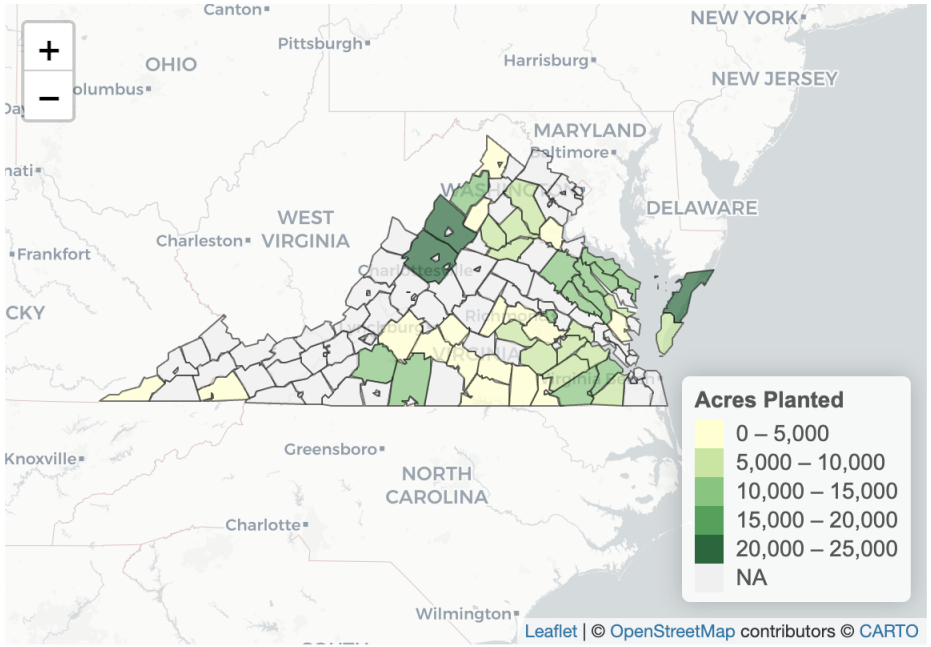
This section displays total corn acres planted across Virginia counties from 2021 to 2024, based on survey data from the USDA National Agricultural Statistics Service (NASS). The data reflects reported planting activity by county for each year, offering insight into regional trends in corn cultivation.

Some counties or independent cities may not appear in the visualizations due to missing or unreported values in the NASS dataset. Additionally, large urban areas with minimal agricultural production—such as Fairfax or Arlington—are often excluded due to their limited involvement in crop planting.

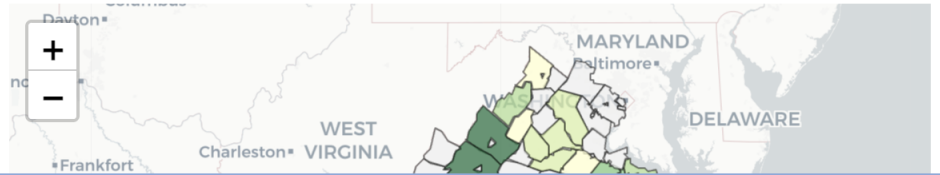
2021



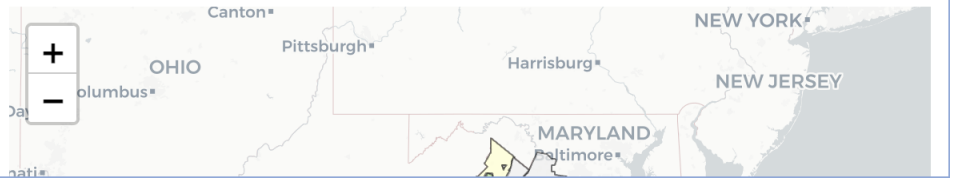
2022



2023

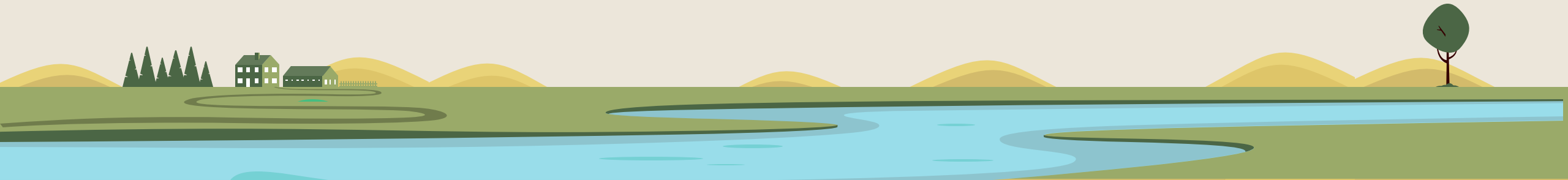


2024



Corn Planting Progress Data Analysis

- Tracks planting pace by showing the cumulative percentage of corn planted in Virgina, week by week, for the selected years.
- Data comes directly from the USDA/NASS API, reflecting the actual reported progress, and updates automatically when new progress is logged.
- Helps to understand how the current planting season's speed compares to recent history.



Planting Progress and Crop Condition Interactive Dashboard

Corn Planting Progress

The plot visualizes the growing percentage of corn planted in Virginia over the planting season weeks for the years you select.

Each line or point represents a different year, showing how planting progresses week by week.

The visualization helps to compare planting pace across different years, to identify trends and understand how current progress lines up with historical patterns.

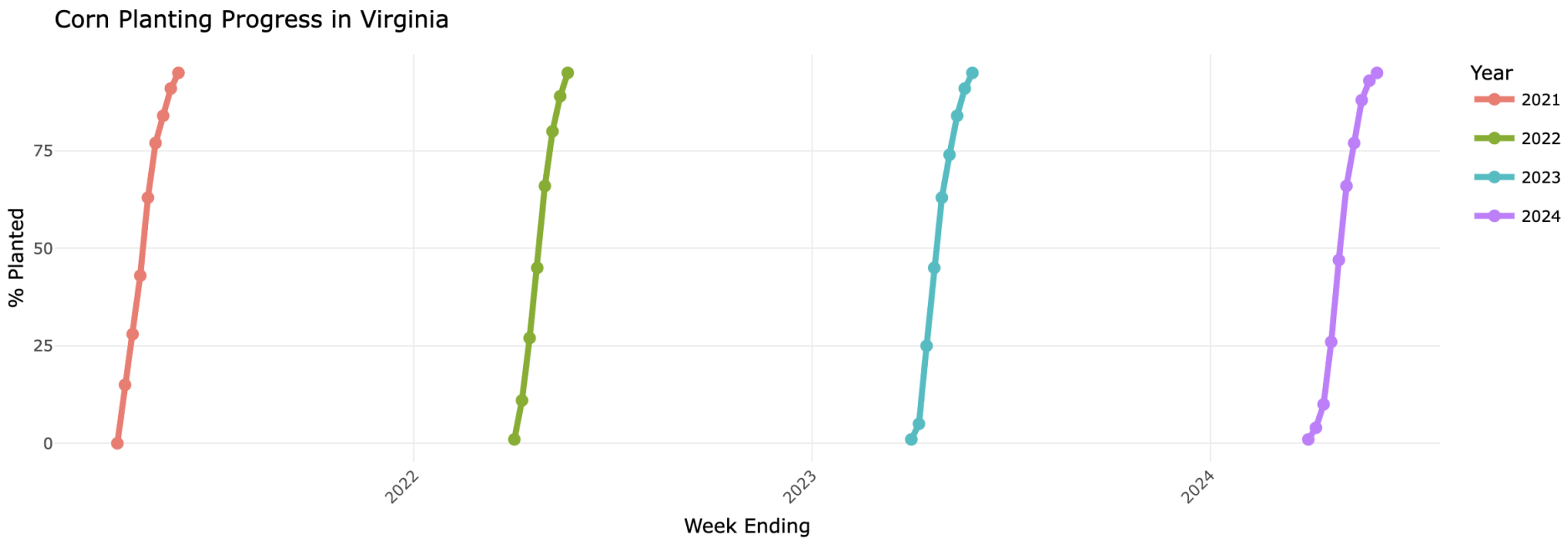
Select Year(s):

2021, 2022, 2023, 2024

Select Date Range:

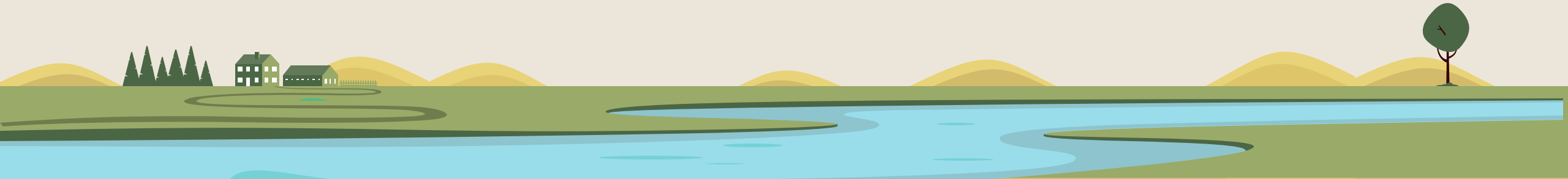
2021-04-01 — 2024-07-31

2021-04-01 2021-12-01 2022-08-02 2023-04-03 2023-12-03 2024-07-31



Corn Yield Data Analysis

- Helps to understand how corn yield trends vary across Virginia/neighboring states.
- Uses official NASS data from website API for county-level corn yield statistics, and includes interactive plots for statewide average yield trends, and automatically updates when new data is logged.
- Allows you to select specific states, defines the historical year range and you can adjust the moving average period.



Planting Progress and Crop Condition Interactive Dashboard

Corn Yield Analysis

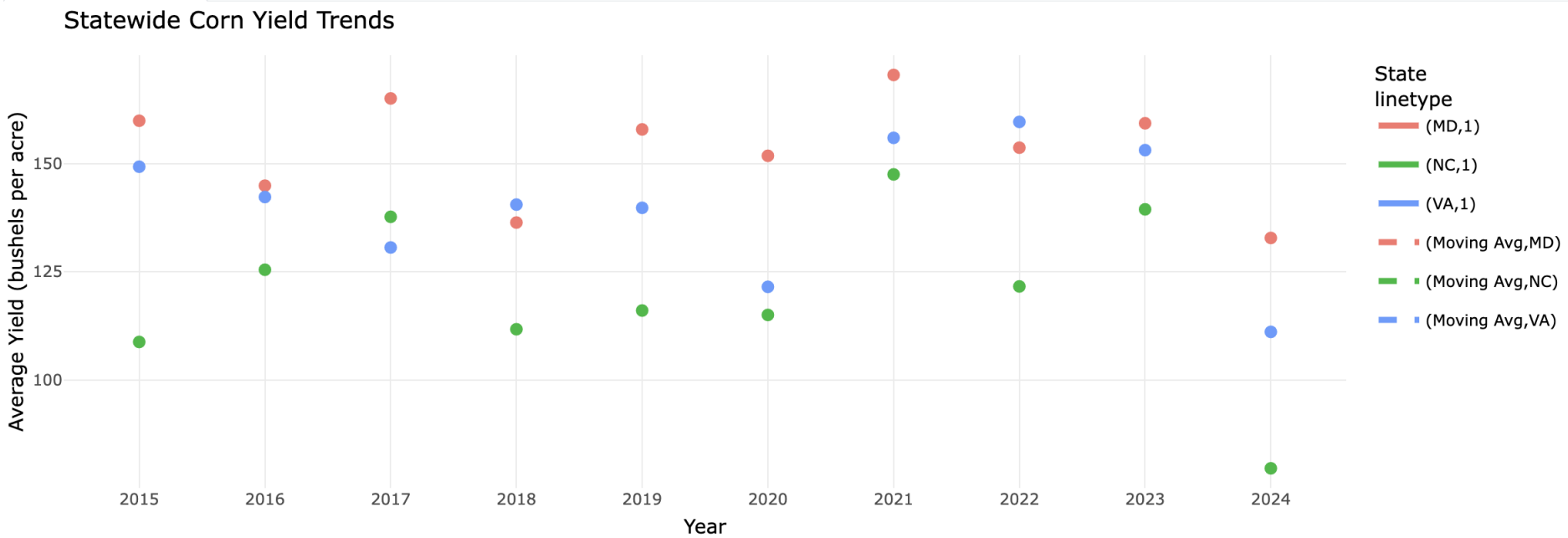
Explore corn yield trends across Virginia and neighboring states.

Select States: Virginia, North Carolina, Maryland

Select Year Range: 2,000 – 2,015 – 2,025 (2,000 2,003 2,006 2,009 2,012 2,015 2,018 2,021 2,024)

Moving Average Window: 5

Yield Trends | Year-over-Year Changes | Summary Statistics



Challenges We Encountered

- A major challenge that our entire office faced was with GitHub and it's integration into RStudio for code commits/pulls/pushes
- We also faced a challenge when trying to connect to the USDA NASS's website API, and faced many errors with the HTTP request not being correctly sent to the API's endpoint.
- Another challenge is the R terminal crashing frequently while running the Shiny dashboard
- Managing and cleaning multi-year data to ensure consistency across counties and time
- Some Difficulty integrating interactive map features using Leaflet in Shiny

Next Steps

- Integrate the weekly crop production report visualizations into the dashboard.
- Contact Montgomery County agricultural agent to inquire about on farm/commercial storage.
- Look for datasets for USDA expected corn export #'s and ending stocks data.
- Incorporate Area Harvested data and explore integration of remote sensing insights through a possible upcoming workshop